

Abstract

A fuel cell is disclosed having a water channel and a polymeric material contained in the water channel which minimizes freezing of water in the channel at sub-zero temperatures. Embodiments including attaching a thermo-responsive polymer such as an N-isopropyl acrylamide to the surface of the water channel to cause the thermo-responsive polymer to expand at low temperatures thereby reducing the propensity for water to freeze in the channel and also to cause the thermo-responsive polymer to contract at higher temperatures thereby preventing any restriction in the flow of circulating water in the channel.